THE OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING FOR RESEARCH AND TECHNOLOGY

NEWSLETTER

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INNOVATING TODAY TO PROTECT OUR FUTURE

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STP&E Launches Cyber Resilient Weapon Systems Book of Knowledge Portal

Cyber Resilient Weapon Systems Book of Knowledge (CRWS-BoK) Portal concept.

STP&E recently launched the Cyber Resilient Weapon Systems Book of Knowledge (CRWS-BoK) Portal (Version 1.0) at https://crws-bok.org. The CRWS-BoK Portal provides a comprehensive repository of guidance and knowledge for science and technology (S&T) professionals specializing in cyber resilient weapon systems. Engineers, S&T program managers, and DoD, Federal Government, industry, and academia researchers will be able to access, search, annotate, save, and share the engineering information they need to develop, maintain, and monitor secure, cyber-resilient weapon systems programs. Under the leadership of Director Melinda Reed, STP&E's Resilient Systems (RS) directorate designed and developed the CRWS-BoK Portal. RS will continually update the Portal with curated guidance so that it remains a living, informative resource.

Resilient Systems Directorate Provides Software Assurance Expertise and Guidance to DoD Stakeholders

Collaboration with DoD Stakeholders to advance software assurance (SwA) across the DoD enterprise.

STP&E's RS directorate continues to collaborate with DoD stakeholders on advancing software assurance (SwA) across the DoD enterprise through the RS-led Joint Federated Assurance Center (JFAC). JFAC brings DoD components together on SwA efforts. In May, STP&E met with National Security Agency (NSA) personnel to discuss a DoD SwA modernization strategy. This strategy will advance SwA assessment capabilities and help mature and transition science and technology (S&T) efforts in support of DoD programs. RS Director Melinda Reed co-chaired the quarterly SwA Community of Practice (CoP) along with NSA and the National Nuclear Security Administration (NNSA) leadership. The SwA CoP included presentations covering continuous authorization as part of the DoD Development, Security, and Operations (DevSecOps) initiative; software modernization through the U.S. Navy's Black Pearl program; and program assurance experience briefings from the U.S. Air Force, U.S. Navy, and NNSA. RS also briefed a JFAC SwA overview to hypersonics stakeholders in May. The overview focused on promoting SwA best practices and discussed how JFAC's SwA efforts have a continual impact on R&E modernization areas. RS continues to promote JFAC's SwA capabilities and share how JFAC supports DoD in ensuring secure and resilient systems.

STP&E Plays Key Role in Ongoing Inspector General Assessment on Foreign Influence

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In May, STP&E's Maintaining Technology Advantage (MTA) directorate participated with partners from the Office of the Under Secretary of Defense for Intelligence and Security (OUSD(I&S)) and Defense Advanced Research Projects Agency (DARPA) in the entrance conference for a DoD Office of the Inspector General (OIG) assessment on evaluating foreign influence in DoD research and development (R&D). The assessor's evaluations aimed to determine the extent of OUSD(R&E) monitoring and mitigation efforts on the matter. The DoD OIG will evaluate the implementation and execution of programs established to identify and protect critical programs and technology and to integrate counterintelligence activities supporting research and development. STP&E will contribute any necessary materials for the report.

STP&E Participates in Synthetic Biology Workshop to Advance DoD Support for Emerging Technologies

STP&E's MTA directorate participated in the 13 May, 2021 National Academies of Sciences Engineering and Medicine (NASEM) Workshop, "Protecting Critical Technologies for National Security in an Era of Openness and Competition Workshop on Synthetic Biology." DARPA sponsored the workshop. Three panels composed of academic, industry, and government speakers discussed the scientific and policy history of synthetic biology; the direction of synthetic biology; and challenges and ways forward for this technology. This was the first of three planned workshops covering synthetic biology, artificial intelligence, and microelectronics. The workshop will report on how agencies (funded by federal research and development initiatives) evaluate the openness of science and encourage transition from idea to commercialization; identify the solutions required to address market or institutional challenges; and recommend appropriate policy changes related to research activities.

Technology and Manufacturing Industrial Base (TMIB) Director Highlights Condition Based Maintenance Plus Technology Advancements

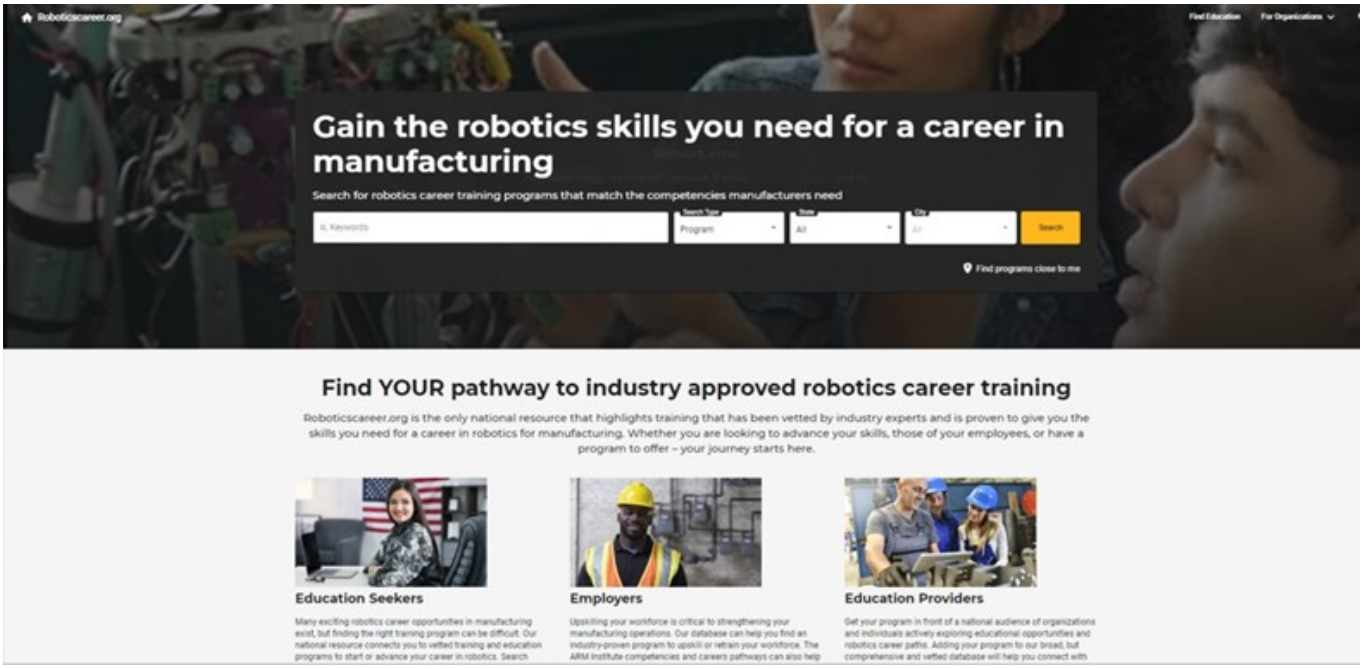
Condition Based Maintenance Plus (CBM+) concept.

Technology and Manufacturing Industrial Base (TMIB) Director Robert Gold presented at the May 2021 Condition Based Maintenance Plus (CBM+) Senior Leader Summit Panel. CBM+ is a collaborative DoD readiness initiative focused on developing and implementing data analysis and sustainment technology capabilities to improve weapon system availability and achieve optimum costs across the DoD enterprise. Mr. Gold's presentation highlighted how the U.S. manufacturing community's current technologies contribute to CBM+ advancements. Additional presentations focused on CBM+ benefits, including how the technology could eventually manufacture human tendons to address injuries.

TMIB Directorate Provides Additive Manufacturing Expertise for DoD and NATO

The TMIB directorate under STP&E continued to manage OUSD(R&E) additive manufacturing (AM) policy and provided AM expertise for both DoD and international stakeholders. TMIB Director Robert Gold gave keynote remarks at the U.S. Army Engineer Research and Development Center Additive Manufacturing Workshop in May 2021. The workshop participants, including DoD senior leaders, identified science and technology gaps in computing, real-time sensor feedback, and cybersecurity for AM and DoD-connected systems. TMIB also provided cleared information to a North Atlantic Treaty Organization (NATO) Science and Technology Organization Research Task Group (RTG) on AM use in NATO operations. The NATO RTG will share the information with other NATO Members and Enhanced Opportunity Partners to find common solutions for AM use in NATO logistics, operations, and exercises.

Advanced Robotics for Manufacturing Institute and DoD Launch National Capability to Connect Students and Workers to Skilled Robotics Careers



With the passage of the U.S. Innovation and Competition Act in the U.S. Senate on 8 June, President Biden said, "By strengthening our innovation infrastructure, we can lay the foundation for the next generation of American jobs and American leadership in manufacturing and technology."

The Advanced Robotics for Manufacturing (ARM) Institute, a DoD Manufacturing Innovation Institute (MII), recognizes the challenge presented by the estimated 2.1 million unfilled manufacturing jobs between today and 2030 and the impacts to the U.S. economy and defense industrial supply chain of leaving this labor force lagging. Leveraging its 300-plus member consortium and DoD strategic partners, as well as insight from the Departments of Commerce and Labor, the ARM Institute has taken a significant step in supporting the Nation's efforts to tackle this issue with the inauguration of RoboticsCareer.org.

RoboticsCareer.Org is a federally funded, national capability that connects students and workers with leading robotics education programs for manufacturing careers. Updated daily, this free resource lists approximately 10,000 programs from over 1,200 educational organizations in the United States and Territories. This information can be searched based upon location, education delivery (e.g. online or onsite), and other keywords.

Of significance, the ARM consortium has identified the competencies and skills that manufacturers most desire for robotics roles and matched them to every program, providing insight and guidance to students, academics, and job seekers.

Newest DoD MII Institute BioMADE Opened in April

BioMADE, the newest MII awarded by DoD in October 2020, officially opened its doors in April with a virtual launch event featuring industry, academic, and government leaders. Attendees included U.S. Secretary of Agriculture Tom Vilsack, Congressman John Garamendi, companies and universities from around the country, and the BioMADE leadership team. BioMADE also opened its inaugural request for proposals - including for technology and innovation projects and education and workforce development projects- in April.

As a nonprofit, public-private partnership, BioMADE has the flexibility to propel new biotechnology products from the laboratory to the commercial market.

Headquartered at the University of Minnesota in Minneapolis-St. Paul, BioMADE is building a sustainable, domestic, end-to-end bioindustrial manufacturing ecosystem. Bioindustrial manufacturing uses living organisms such as bacteria, yeast, and algae to make industrial products. These processes can yield entirely new products and technologies, ranging from food to textiles to fuels.

For more information and to watch a recording of the event, visit www.biomade.org.

[1] Creating pathways for tomorrow's workforce today, Deloitte, May 4, 2021

AIM Photonics Successes Will Aid Artificial Intelligence and Machine Learning in Manufacturing

The United States is winning a global battle for domination in integrated photonics—the use of light for applications traditionally addressed through electronics—thanks in part to DoD MII AIM Photonics, established in 2014. Manufacturers embracing artificial intelligence (AI) and machine learning (ML) will benefit greatly because they require large amounts of computing capacity, according to Acting CEO of AIM Photonics John Bowers in a recent SME interview.

"The chips that Intel and Broadcom announced recently are 25-terabyte-per-second chips, so that's 25,000 gigabytes/second, or 25 million megabytes/second," he said. "It lets your networks just keep getting faster and more complex, so they can handle more data."

To reach the goal of building terabyte chips alongside industry partners like Intel and Broadcom, AIM Photonics has played a leading role in three dramatic shifts in microchip manufacturing.

One of those shifts is in 3D-bonding optics with electronics, and AIM Photonics has what Bowers called "a major new research effort" to integrate all the photonic elements on silicon. "That means that the input and the output on electronic chips can now be optical"—which simultaneously increases the speed and capacity of data transfer and reduces the power required to do so. "Before long, your processor in your computer will be communicating with other chips in your computer optically," he added. "That is a huge revolution."

Defense Research at Historically Black Colleges and Universities and Minority Institutions (HBCU/MIs) Webinar

Image Sourced from iStock

In June, Dr. Jagadeesh Pamulapati (Acting Deputy Director, Research, Technology and Laboratories), Mr. Louie Lopez (Director, DoD STEM), Ms. Karrin Felton (Program Manager, SMART Program), Ms. Evelyn Kent (Program Manager, HBCU/MI Program), Dr. Joan Fuller (Director for FFRDC/UARCs), and Dr. Michael Robinson (Manager, Basic Research, Defense Threat Reduction Agency) participated in a panel discussion about DoD investments in academic institutions, particularly HBCUs/MIs, and discussed the available opportunities for HBCUs/MIs to increase their success in securing DoD funding. The National Academies of Sciences, Engineering, and Medicine (NASEM) hosted the event under the auspices of the Board on Higher Education and Workforce for the Committee on Defense Research at HBCUs and Other Minority Institutions. This discussion aids in the development of DoD HBCU/MI program's congressionally-mandated study with the NASEM. To access this previously recorded webinar, visit https://www.nationalacademies.org/event/06-14-2021/defense-research-at-historically-black-colleges-and-universities-and-other-minority-institutions-meeting-5

Maintaining our Commitment to Military Students: Ensuring Access to High Quality Advanced Science, Technology, Engineering, and Mathematics (STEM) Programs Webinar

On 17 June 2021, DoD STEM Director Louie Lopez participated in a panel discussion on military-connected students and access to quality science, technology, engineering, and mathematics (STEM) education with Dr. Bernard Harris (Chief Executive Officer, National Math and Science Initiative (NMSI)), Dr. Jerrod Wheeler (Superintendent, Knob Noster School District in Missouri), and Demetria Adderley (former military student whose father served in the Navy for 25 years), who is a current 4th grade teacher from DeKalb County School District in Georgia and pursuing a doctorate on this subject. Military-connected students and their families face a unique set of challenges largely brought about by frequent relocations, including the portability of academic credits and credentials, access to extracurricular activities, reduced access to extracurricular activities, and obstacles to family engagement. This webinar highlighted the power of Advanced Placement STEM coursework and pathways to better serving this student population. The panel featured leaders serving military communities from the national, district, and local classroom levels, who provided information on actionable resources and concrete tactics for empowering military-connected students and families. NMSI, a Defense STEM Education Consortium partner, hosted the event. To access this previously recorded webinar, please visit https://whiteboardadvisors.zoom.us/webinar/register/5116227289639/WN_bvOsnW7DQda0PichOfXWww.

Advanced Manufacturing: Jobs of the Future Webinar

On 18 June, OSD ManTech and DoD STEM's Manufacturing Engineering Education Program (MEEP) partners NEXTFLEX and Monroe Community College participated in a panel discussion with Naval Surface Warfare Center Carderock and several Department of Education representatives. Officials hosted the panel to discuss the shortage of Americans with the STEM knowledge and technical skills needed for advanced manufacturing jobs, and what the Departments of Defense and Education were doing to develop the workforce skills needed in advanced manufacturing. The discussion included how new manufacturing methods and production of new products enabled by innovation served as an engine of America's economic power and a pillar of its national security. The Department of Education hosted the event. To access this previously recorded webinar, visit https://www.eventbrite.com/e/stem-webinar-advanced-manufacturing-jobs-of-the-future-registration-154737017585.

DoD Innovators Spotlight Series—Awardees across the Defense Enterprise Share their Cutting-edge Work and Best Practices

T2 Advocate of the Quarter:

Ms. Sarah Buttrick
School Liaison Officer
at the Naval Sea Systems Command's
Portsmouth Naval Shipyard in Maine

STEM Advocate of the Quarter:

Dr. Cynthia Doil
School Liaison Officer
Scott Air Force Base in Illinois

On 22 June, the Office of the Director of Defense Research and Engineering for Research and Technology hosted featured award winners: Ms. Sarah Buttrick, Strategic Planning and T2 at the Naval Sea Systems Command's Naval Portsmouth Naval Shipyard in Maine, and Dr. Cynthia Doil, School Liaison Officer at Scott Air Force Base in Illinois. Ms. Buttrick received the T2 Advocate of the Quarter, which recognizes outstanding T2 efforts that further DoD's mission; and Dr. Doil received the STEM Advocate of the Quarter, which recognizes outstanding STEM education and outreach efforts that further DoD's mission. Both awardees presented on the innovative work and best practices they have been recognized for by the Department. The next DoD Innovators Spotlight Series event will take place on 20 July. For more information and to register, visit https://dodstem.us/meet/innovators/.

Naval Horizons High School 2021 Challenge

Naval Horizons introduces students to cutting-edge STEM topics that impact the U.S. Navy & Marine Corps, including: autonomy, oceanography, cybersecurity, undersea medicine, and more. Through this video series, students will learn about Naval STEM challenges, scientists, and engineers. Then, students will write essays explaining how the research and people inspire them. This contest challenges students to picture themselves in a STEM career by designing the U.S. Navy & Marine Corps of the future. Submissions are due by 11:59pm ET on 30 July. For more information, visit https://navalhorizons.us/.

The DoD Sponsors Student Innovators through the FIRST Robotics Competitions

From 28-30 July, For Inspiration and Recognition of Science and Technology (FIRST), a DoD strategic partner under the Defense STEM Education Consortium, will host the FIRST Global Innovation Awards in partnership with Star Wars: Force for Change, which hopes to inspire and celebrate the next generation of entrepreneurs and innovators who will change the future. This gathering will spotlight twenty finalist teams from each of the three FIRST programs: 1) FIRST LEGO® League (FLL); 2) FIRST Tech Challenge (FTC); and 3) FIRST Robotics Competition (FRC). These finalists will showcase and present their research and inventions to virtual attendees, including key industry leaders. During the 2020-2021 season, DoD STEM sponsored more than 1,300 participants in activities and events, despite an exceptionally challenging year due to the COVID-19 pandemic, by pivoting to virtual and hybrid formats. To learn more and watch this event, please visit https://info.firstinspires.org/global-innovation, and to check out several innovations from DoD-sponsored finalist teams, visit https://dodstem.us/meet/blog/

Rebooting Letters of Marque for Private Sector Active Cyber Defense

On a daily basis, hackers target businesses and individuals to steal data or damage digital systems. In many cases, hostile foreign powers directly sponsor or otherwise enable the attackers. Letters of Marque, a maritime tactic popular from the Middle Ages through the 19th century, could find renewed life in the Department's effort to counter and deter international cyber-attacks. Governments granted Letters of Marque, official licenses, to private ship owners which allowed them to take war-like reprisal actions against enemy states outside the grantor nation's borders.

A Cyber Letter of Marque would permit a vetted, trained, and authorized American business to watch outside its network to look for pre-attack indicators and, when attacked, respond beyond the network borders. Published in April 2020 by the Cyber Security & Information Systems Information Analysis Center (CSIAC)—one of three DoD Information Analysis Centers managed by the Defense Technical Information Center—this article examines the constitutional and international legal basis for potential employment of this tool. Read the full article at https://www.csiac.org/journal-article/rebooting-letters-of-marque/.

HDIAC Hosts Webinar on Science and Technology Protection Efforts

On 13 May, the Homeland Defense and Security Information Analysis Center (HDIAC) hosted a webinar about DoD's S&T protection efforts to counter foreign influence. Nearly 200 of HDIAC's members attended the presentation by Kristopher E. Gardner, the Director for S&T Protection in the Office of Strategic Technology Protection and Exploitation (STP&E).

In an era of great power competition, DoD must preserve the Nation's technological advantage, protect U.S. infrastructure from unwanted foreign influence, and prevent harmful technology transfer. STP&E—DoD's lead organization in maintaining technology advantage through mitigating vulnerabilities and exploitation—oversees program protection policy, software assurance, and anti-tamper practices.

During the webinar, Gardner discussed the Department's development of standardized research security efforts and offering new program protection resources and STP&E's creation and circulation of best practices in research security and program protection with DoD, U.S. government, academic, and international partners. The discussion also included STP&E's development of consistent risk methodologies and tailored S&T protection measures for DoD's Modernization Priorities.

A recording of the webinar is available to view at https://www.hdiac.org/podcast/dods-research-security/.
HDIAC is one of three DoD Information Analysis Centers managed by the Defense Technical Information Center (DTIC). HDIAC's mission is to leverage expertise from government, industry, and academia to provide scientific and technical analysis and information products in eight technical focus areas. For more information about HDIAC, please visit https://www.hdiac.org/.

THE OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING FOR RESEARCH AND TECHNOLOGY

PROVIDING SCIENCE AND TECHNOLOGY LEADERSHIP THROUGHOUT DOD TO MEET THE CHALLENGES OF TODAY AND TOMORROW

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